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UNITED STATES NAVAL OBSERVATORY

CIRCULAR NO. 78

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U. S. Naval Observatory, Washington 25, D. C.

July 3, 1957

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THE TOTAL ECLIPSE OF OCTOBER 2, 1959

PATH OF TOTAL PHASE IN THE UNITED STATES

By Simone Daro Gossner

This Circular is intended to provide the means of obtaining, with a minimum of calculation, the local circumstances of the eclipse of October 2, 1959, within that part of the path of totality which lies in the United States. General information concerning this eclipse will be found in the AMERICAN EPHEMERIS AND NAUTICAL ALMANAC for 1959.

The central line within the United States has an extent of about 63 miles, from Baldwinsville to Salem, Massachusetts. The width of the path of totality is about 38 miles. The altitude of the center of the Sun at all points is less than 2 degrees. The total eclipse occurs very shortly after sunrise. The beginning of the eclipse, or first contact, occurs at all places in this region with the Sun below the horizon, and the Sun rises partially eclipsed. The fourth contact occurs everywhere within less than a minute from 11<sup>h</sup> 51<sup>m</sup> U.T.



The Universal Time of mid-totality for a given place may be obtained to the nearest second by interpolation from the curves on the map, pages 4-5. The semiduration of totality may be interpolated from Table III, page 6. The Universal Time of second contact is found by subtracting the semiduration from the time of mid-totality. Similarly, the Universal Time of third contact is found by adding the semiduration to the time of mid-totality.

The magnitude of the total phase is nearly constant at all points within the path. Its value is 1.02 in units of the solar diameter.

The data given in this Circular have been computed without regard to refraction or elevation above sea level. For scientific observations requiring the utmost accuracy in the predictions, it is always advisable to perform a complete computation for the exact location of the observer. It should be remembered also that eclipse computations are carried out for the center of the Sun, whereas sunrise as usually defined occurs when the upper limb of the Sun, corrected for the effect of refraction, is on the horizon. Therefore it will be possible to observe at least a part of the total phase in a region extending several miles to the west of the curve marked "Middle at Sunrise" on the map.

The map on pages 4-5 shows the position of the central line, and of the northern and southern limits of the path of totality, together with the lines connecting all places where the middle of the eclipse occurs at the Universal Times indicated. The map is a composite of sections of the base maps of Massachusetts and New Hampshire published by the U.S. Geological Survey.

Table I, page 3, gives the latitudes of the points on the southern limit, central line, and northern limit, and the duration of the total phase on the central line for every 10' of longitude. The time arguments have been omitted because they are different for each of the curves.



The western limits of those three curves and the times at these limits are given in Table II, page 6. About one second elapses between the western limit of each curve and the point where it reaches the Atlantic coast.

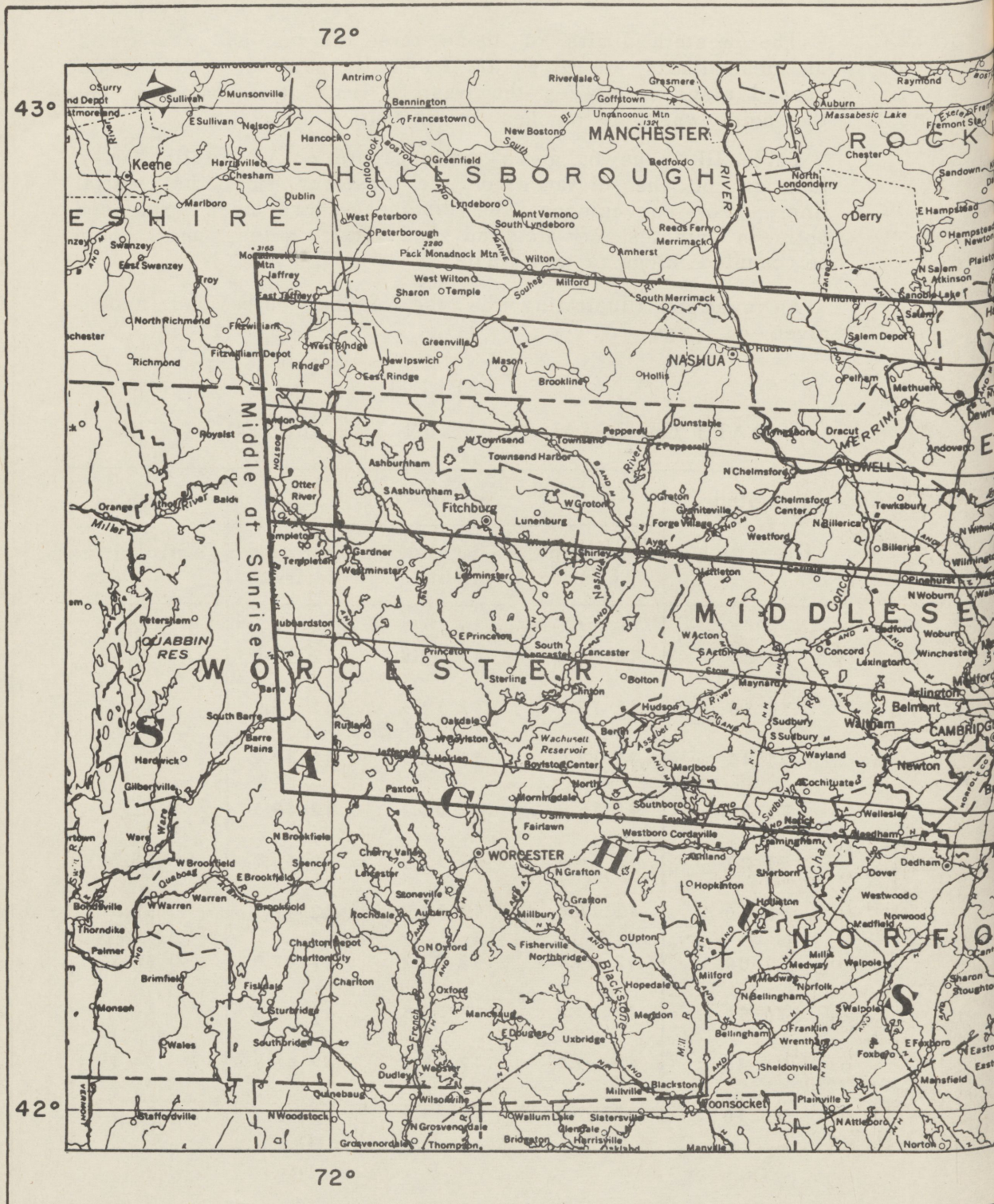
Table III, page 6, gives the semiduration of totality as a function of the distance of the observer from the central line. For convenience, the distances have been expressed both in minutes of arc and in statute miles, and should be counted along a meridian.

An example illustrating the use of the tables and map is given on page 7.

TABLE I  
PATH OF TOTAL PHASE IN THE UNITED STATES

| Longitude<br>from<br>Greenwich | Latitude          |                  |                   | Duration<br>on<br>Central Line |
|--------------------------------|-------------------|------------------|-------------------|--------------------------------|
|                                | Southern<br>Limit | Central<br>Line* | Northern<br>Limit |                                |
| ° ' /                          | ° ' /             | ° ' /            | ° ' /             | s                              |
| 72 00                          | 42 18.9           | 42 34.9          | 42 51.0           | 55.0                           |
| 71 50                          | 42 18.2           | 42 34.3          | 42 50.5           | 55.1                           |
| 71 40                          | 42 17.6           | 42 33.7          | 42 49.9           | 55.3                           |
| 71 30                          | 42 16.9           | 42 33.1          | 42 49.3           | 55.5                           |
| 71 20                          | 42 16.3           | 42 32.5          | 42 48.7           | 55.7                           |
| 71 10                          | 42 15.6           | 42 31.8          | 42 48.1           | 55.8                           |
| 71 00                          | 42 14.9           | 42 31.2          | 42 47.5           | 56.0                           |
| 70 50                          | 42 14.2           | 42 30.6          | 42 46.9           | 56.2                           |
| 70 40                          | 42 13.5           | 42 29.9          | 42 46.3           | 56.4                           |
| 70 30                          | 42 12.8           | 42 29.2          | 42 45.7           | 56.6                           |







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Map of the Cape Cod area showing the 10h50m isochrone lines and the Central Line. The map includes latitude and longitude markings (42° to 43° N, 70° W), a scale bar (0 to 30 miles), and labels for various locations including Boston, Cape Cod, and the Central Line. The 10h50m isochrone lines are labeled with times: 10h50m30s, 10h50m25s, 10h50m20s, 10h50m15s, and 10h50m10s. The Central Line is labeled 'Central Line'. The Southern Limit is labeled 'Southern Limit'. The Northern Limit is labeled 'Northern Limit'. The map also shows the locations of Cape Ann, Gloucester, and other coastal towns.



TABLE II  
WESTERN LIMITS OF THE PATH OF TOTAL PHASE

|                | Universal Time | Latitude | Longitude<br>from<br>Greenwich |
|----------------|----------------|----------|--------------------------------|
|                | h m s          | ° '      | ° '                            |
| Southern Limit | 10 50 08.0     | 42 19.1  | 72 03.9                        |
| Central Line   | 10 50 19.9     | 42 35.2  | 72 05.1                        |
| Northern Limit | 10 50 32.0     | 42 51.4  | 72 06.4                        |

TABLE III  
SEMIDURATION OF TOTAL PHASE

| Distance<br>from<br>Central Line |       | Longitude |       |       |       |
|----------------------------------|-------|-----------|-------|-------|-------|
|                                  |       | ° '       | ° '   | ° '   | ° '   |
|                                  |       | 72 00     | 71 30 | 71 00 | 70 30 |
| '                                | miles | s         | s     | s     | s     |
| 0                                | 0.0   | 27.5      | 27.7  | 28.0  | 28.3  |
| 2                                | 2.3   | 27.3      | 27.5  | 27.8  | 28.1  |
| 4                                | 4.6   | 26.6      | 26.8  | 27.1  | 27.4  |
| 6                                | 6.9   | 25.5      | 25.7  | 26.0  | 26.3  |
| 8                                | 9.2   | 23.8      | 24.1  | 24.4  | 24.7  |
| 10                               | 11.5  | 21.5      | 21.8  | 22.1  | 22.5  |
| 12                               | 13.8  | 18.3      | 18.6  | 19.0  | 19.4  |
| 14                               | 16.1  | 13.4      | 13.8  | 14.3  | 14.9  |
| 15                               | 17.3  | 9.8       | 10.4  | 11.0  | 11.6  |



EXAMPLE: Find the Universal Times of beginning and end of total phase for a station located at latitude  $42^{\circ} 40'$ , longitude  $71^{\circ} 24'$ .

On the map we find that the station lies between the curves labeled  $10^h 50^m 25^s$  and  $10^h 50^m 30^s$ , at approximately one-fifth of the interval from the former. Thus we adopt  $10^h 50^m 26^s$  as the Universal Time of mid-totality at the station.

Interpolating from Table I, we find that at longitude  $71^{\circ} 24'$  the latitude of the central line is  $42^{\circ} 33'$ . The distance of the station from the central line, counted along the meridian, is therefore  $7'$ . An alternate procedure would be to measure on the map the distance in miles from the station to the central line. This distance is approximately 8 miles.

Using  $7'$  (or 8 miles) as the vertical argument, we find from Table III that the semiduration of totality at longitude  $71^{\circ} 24'$  is 25 seconds. Applying the semiduration to the time of mid-totality found above, we obtain

|                        |                  |
|------------------------|------------------|
| U.T. of second contact | $10^h 50^m 01^s$ |
| U.T. of third contact  | 10 50 51         |